Roadway Network System Project
Economic Feasibility Study
(Cost-Benefit Analysis)

Project Description

The Roadway Network System Project (RNS) creates a replacement system for the aging Highway Traffic Records Information System (HTRIS). The new system incorporates a relational database that provides universal enterprise data access, links geo-spatial data and business attributes to the roadway centerlines, and provides web accessibility to users currently unable to retrieve critical roadway data.

The scope of work includes the migration of all the data from the ADABAS HTRIS system to the Oracle RNS; ensuring the roadway geo-spatial data is aligned with the roadway centerlines; connecting the business data to the geo-spatial roadway data; building a web-based system for retrieving the roadway and business data; and improving business processes that have been limited due to the older HTRIS technology.

During a project business process review team meeting held April 13 with ITA & Business Team members, a decision was made regarding disposition of each of the ten subsystems currently in HTRIS. The recommendation made is to include all functions of five subsystems (RDI, HPM, ACC, RRX, & CEN), include some functions of one subsystem (PAV), link RNS to two mature Oracle systems (SPZ & TMS), and transfer functions from two HTRIS subsystems to other existing or planned information systems (TCI & STI) instead of incorporating these business functions in RNS. This meeting further clarifies the scope of the RNS project and reduces the anticipated development effort significantly.

Project Costs

All of the following figures are given in 2004 "current dollars," and no attempt has been made to account for inflation, the cost of money, changes in vendor pricing, or shifts in product capability resulting in price changes.

Development Phase Labor Costs

Two different estimates were calculated to determine an estimated labor cost of developing the RNS. Independently, a top-down analogous estimate using the WebIMS project and a bottom-up task-based estimate using the Work Breakdown Structure (WBS) was performed to derive estimates of $3.2M and $3.6M respectively. These estimates vary by a mere 11% and therefore would seem to represent a high reliability in the estimating process.

The first attempt at estimating the labor cost for this project was done during the fall of 2003 using an analogous estimating technique. A similar and smaller development

project recently undertaken by ITA to replace the ADABAS Inventory Management System (IMS) with a new WebIMS Oracle system had enough project cost data that could be compiled for comparison purposes. WebIMS did not include the addition of geo-spatial referencing as is required for the RNS so various factors were added and some inflated for the comparison of effort between the two projects. The difficulty of various tasks of the two projects was considered, evaluated, and compared. The results below identify the actual resource requirements of various tasks as documented for the WebIMS system and the estimates projected for the RNS as determined by the entire RNS project team.

Resource Type	WebIMS		RNS Project Projections		
	Staff	Man-Yrs	Factor	Man-Yrs	Staffing Cost Estimate
Project Manager	1	1.5	2	3.0	$360,000
Database Architect	0	0	-	0.5	$120,000
Design, Development, Testing	6	4.9	3.5	17.1	$2,052,000
Technical Writing	1	1.6	1.8	2.4	$288,000
Interface Development	3	0.1	15	1.5	$180,000
Database Analysts	1	0.2	5	1.0	$120,000
System Manager	2	0.1	5	0.5	$60,000
Extracts/Clean & Scrub	1	0.1	5	0.5	$60,000
TOTAL	15	8.5	5	26.5	$3,240,000

An examination of the loaded labor rates for both VDOT employees and consultants determined that the figure of $120K/yr should be used for both types of labor. The RNS project is estimated to require approximately 27 man-years of staff and services labor, which totals to an estimate of approximately $3.2M.

The second attempt at estimating the labor cost for this project was done during March of 2004 following a bottom-up estimating technique using the WBS that had been developed by the IT Applications project team over a number of months. The WBS details may be found in the file "RNS WBS 04-16-04.html" based on the RNS MS Project file and represents a detailed analysis of the tasks associated with development of three of the ten subsystems. Extrapolation for the remaining subsystems was done after many interviews and several meetings with the business team members to document the current business processes for each of the HTRIS subsystems. For details regarding the analysis of the ten current HTRIS business functions, refer to the April 13 Business Team Meeting minutes, PowerPoint presentation, and the HTRIS Current Business Processes document (version 0.3). This bottom-up estimate concludes that the labor cost to complete the project based on the identified tasks in the WBS will cost approximately $3.6M.

Since a bottom-up estimate is considered to be a more detailed and therefore more accurate estimate of work to be performed, the figure of $3.6M is used as the bases for all Cost-Benefit estimating until further analysis and revision of the WBS provides the baseline for the project schedule and resource allocation.

Operational Phase Labor Costs

Direct support costs to the servers (System Administration) are covered under the flat rate charged by VITA, as are at least some portion of DBA costs for software. Beyond this, we must assume that maintaining and operating the new RNS system require no different labor expenses than what we see today for HTRIS. Currently two ITA staff members support HTRIS. Current funding levels for maintaining the HTRIS system and the operational support costs for the new replacement RNS are projected to be equivalent and no additional costs or savings are anticipated.

Hardware Costs

During the development phase, the system hardware and software will be procured. Two separate sets of hardware and software will be utilized containing both development and test environments. The first set will be purchased in early FY2005. The second set will be for the production implementation and purchased in FY2006. At the end of the development process (end of FY2007), both sets of hardware are transitioned into operational use; the development/test set for further O&M support use, and the production set for live operations.

The mostly likely configuration involves using two servers (application and data) for the development/test environment and three for the production environment (application and two data). Application servers are estimated to cost about $10K each, and data servers are $20K each. VITA is developing a new software and hardware model, which will be in place by the time we are ready to purchase hardware. At that time we will pay a monthly fee to them. This covers the hardware, O/S software (we are assuming it also covers the required MS-IIS software), maintenance, and basic System Administrator support (backups, etc.). For our purposes we used monthly cost figures of $338/month for an application server, and $1336/month for a data server at today's VITA prices.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Totals
Dev. Env.											
App Server		$3.4K	$4.1K	$4.1K	$4.1K	$4.1K	$4.1K	$4.1K	$4.1K	$4.1K	$35.8K
Data Server		$13.3K	$16K	$16K	$16K	$16K	$16K	$16K	$16K	$16K	$141.6K
Prod. Env.											
App Server			$3.4K	$4.1K	$4.1K	$4.1K	$4.1K	$4.1K	$4.1K	$4.1K	$31.8K
Data Server (2)			$26.7K	$32.1K	$32.1K	$32.1K	$32.1K	$32.1K	$32.1K	$32.1K	$251.2K
Total Hardware Cost		$16.7K	$50.2K	$56.2K	$56.2K	$56.2K	$56.2K	$56.2K	$56.2K	$56.2K	$460.4K[1]

[1] Does not total exactly horizontally and vertically due to rounding errors.

Software Costs

Software that will be used by this project includes Oracle RDBMS , ESRI ArcSDE, ArcIMS, ArcEditor and ArcView, and Servlet Exec.

Application	# Processors in Use	Purchase Cost	Maint Cost	VITA Cost
Servlet Exec	2	<$10K (Assume $2K)	Unknown, assumed at $2K/yr	$2200 purchase, plus $313/mo per application server
Oracle	2 in Dev/Test 2 in Prod.	Dev/Test: "free" under "900 concurrent user" license $40K per processor 2 servers for 2 proc/server = $160 K	22% yr ($8800 per processor)	$0 for Dev $174,200 total purchase, plus $(2x$313=) $1252/mo
ArcSDE	2 in Dev/Test 2 in Prod.	(2 x $10K =) $20K purchase each of two servers	$3K/yr per license	$21,800 total purchase, plus $626/mo per server
ArcIMS	1 in Dev/Test 1 in Prod.	$7.5K purchase per license	$1.5K/yr per license	$8200 purchase, plus $313/mo each license
ArcEditor	5 Prod. (Dev/Test will use existing GIS Office licenses)	$7K per license purchase	$1.5K/yr primary $1.2K/yr secondary	$7,600 purchase, plus $313/mo each license
ArcView (concurrent users)	10 (8 for Prod. & 2 for Dev/Test)	$3.5K per license purchase	$700/yr primary $400/yr secondary	$3,8000 purchase, plus $313/mo each server

The net cost for software is then given by the following table:

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Totals
Dev. Env.											
Oracle (2)		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ArcSDE (2)		$28.1K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$88.2K
ArcIMS (1)		$11.3K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$41.4K
ArcView (2)		$13.9K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$74K
ServletExec (1)		$5.3K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$35.4K
Prod. Env.											
Oracle (2)			$186.7K	$15K	$15K	$15K	$15K	$15K	$15K	$15K	$291.9K
ArcSDE (2)			$28.1K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$7.5K	$80.6K
ArcIMS (1)			$11.3K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$37.6K
ArcEditor (5)			$53.7K	$18.8K	$18.8K	$18.8K	$18.8K	$18.8K	$18.8K	$18.8K	$185.1K
ArcView (8)			$55.5K	$30K	$30K	$30K	$30K	$30K	$30K	$30K	$265.8K
ServletExec (1)			$5.3K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$3.8K	$31.6K
Total Software Cost		$58.6K	$363.2K	$101.5K	$101.5K	$101.5K	$101.5K	$101.5K	$101.5K	$101.5K	$1132K

Total Development Costs

Development Costs	*FY 2004*	*FY 2005*	*FY 2006*	*FY 2007*	Total
Internal Staff Labor	90,000	600,000	600,000	500,000	1,790,000
Services	90,000	600,000	600,000	500,000	1,790,000
Software		59,000	363,000	102,000	524,000
Hardware		17,000	50,000	56,000	123,000
IV&V	10,000	100,000	50,000	50,000	210,000
UAT & Training	10,000	10,000	50,000	100,000	170,000
Contingency (Risk)	50,000	200,000	200,000	200,000	650,000
Total	$250,000	$1,586,000	$1,913,000	$1,508,000	5,257,000

Total development costs (2004-2007), given the above estimate figures, come to $5,257,000.

Total Operations Costs

Operational Costs	*FY 2008*	*FY 2009*	*FY 2010*	*FY 2011*	*FY 2012*	Total
Internal Staff Labor (No net increase or decrease)						
Services (No net increase or decrease)						
Software	102,000	102,000	102,000	102,000	102,000	510,000
Hardware	56,000	56,000	56,000	56,000	56,000	280,000
UAT & Training	100,000	25,000				125,000
Total	$258,000	$183,000	$158,000	$158,000	$158,000	$915,000

Total costs to operate the system, through 2012, given the above figures, come to $915,000.

Project Tangible Benefits

Tangible benefits of the RNS are derived from: 1) savings due to elimination of mainframe operation costs for the HTRIS system; 2) savings in ETL software costs associated with mainframe data processing; 3) savings in staff labor associated with the supporting annual mainframe ETL requests; and 4) savings anticipated through business process efficiencies anticipated with RNS capabilities and functions that replace both the current HTRIS subsystems and the work-around applications and methodologies that have developed over the past 15 years to compensate for HTRIS functional limitations.

There are over a dozen individual tangible benefits that have been identified as potential savings from implementing the proposed RNS. The total for all cost savings for this project are summed into eight items detailed below and projected as providing a savings to VDOT of over $8.4M. The details outlined below present the method and calculations used to determine each of the separate savings calculations. Where labor savings projections are identified, VDOT anticipates these savings to facilitate re-

allocation of activities and responsibilities to enable resource leveling of overworked staff and facilitate projects or activities that have been pushed to the back burner.

Item 1: Offsetting Mainframe "Retirement" - Cost Savings $1,750,000

Business Objectives
- Eliminate the costs associated with hosting a mainframe application

Benefits

Partially offsetting the above costs will be the removal of the existing HTRIS application from the VITA (DIT) mainframe. Currently VDOT runs 4 applications on this mainframe at a cost of $1.4M/yr. The cost of running an application on a mainframe is a complicated formula involving processor CPU-seconds used, print jobs run, tape, and disk storage operations, etc. VITA has provided a detailing of the summary costs for all four applications, but we do not currently have a breakdown that shows the precise resources used by the existing HTRIS application. As such, the best that we can do is to estimate that the removal of the HTRIS application will result in cost savings of ($1.4M/yr / 4 =) $350K/yr for each year of the evaluated period beginning with the date that the system goes operational (1 July 2007).

Total Savings

Sum total cost savings in this category through 2012 is assumed to be **$1,750,000**.

Item 2: Retirement of VDOT ETL Software/Training - Cost Savings $205,000

Business Objectives
- Eliminate the ETL software costs associated with ADABAS systems.

Benefits

VDOT currently spends $40K per year for NatQuery, DataStage, & ProfileStage, three tools used exclusively for extracting, transforming, and loading data from the ADABAS mainframe applications to other Oracle systems. There is a very strong likelihood that HTRIS will be the only ADABAS system in VDOT's inventory when the new RNS system is fully implemented in 2007. At that time, the RNS will save VDOT the annual cost of these tools and a one-time training cost that is anticipated to be $5K in FY 2008.

Total Savings

Total cost savings for years 2008 through 2012 is estimated at **$205,000.**

Item 3: HTRIS Data Extracts - Cost Avoidance - $350,000

Business Objectives
- Eliminate the need to develop independent processes to extract and download roadway route centerline information and associated data from HTRIS.

Benefits

There are currently four independent systems that could use a route centerline file with spatial referencing from an upgraded HTRIS System:

1. VOIS
2. PMSS
3. Asset Management System
4. Crash Reporting System (actual extract costs calculated at $50K)

It costs $50,000 on average to download route information from HTRIS and upload this data into each of the above systems. The total onetime savings will therefore equal $200K. Crash reporting has already been completed, so there is an anticipated one-time savings of $150K in FY 2005 (once all roadway information is moved to the production system in the early phases of the project). In addition, we assume that other systems at VDOT will need much the same data, and that one system per year for the next four years is projected to undertake the development of similar download processes. Therefore, a total cost avoidance of $200K is assumed beginning in FY 2006 and extending through FY 2009.

Total Savings

The sum total for cost avoidance resulting from development of the RNS in this category is anticipated to be **$350,000**.

Item 4: Roadway Acceptance Process Upgrade (RDI) - Cost Savings $3.655,000

Business Objectives

*   Replace cumbersome data collection process.
*   Facilitate spatially referenced data collection and updates.
*   Reduce time lag between initial roadway acceptance process and entering the data into the official record.
*   Eliminate duplicate data entry and the associated waste of resources.
*   Standardize roadway information.
*   Improve communications and coordination within VDOT Divisions.
*   Improve coordination of VDOT resources with other agencies and businesses.
*   Improve data accuracy and currency.
*   Improve reporting capabilities.

The Virginia Department of Transportation (VDOT) spends billions of dollars per year to build, maintain, and operate the Commonwealth's surface transportation system. Keeping an accurate and up-to-date inventory of this system is vital to many of VDOT's divisions and programs. In addition, this inventory provides information for yearly federal reporting which is the basis for federal funds that VDOT receives.

It is envisioned that the technology upgrade to HTRIS will provide a single user interface through which staff statewide will enter spatially referenced highway inventory data into a relational database. The focus will be on providing an application that will make it easier for field staff to perform their duties, while entering inventory data only

once. As a result, VDOT will have the majority of its spatially referenced data in a relational database that can be spatially enabled utilizing GIS technology.

Benefits
- Data entered once.
- Reduced time for updating the VDOT Roadway Inventory.
- Enhanced customer service.
- Communication of vital spatial data.
- New technologies and methods will greatly enhance this process.
- Updating the system will be more streamlined and efficient.
- Reduce costs by reducing paperwork and duplication of effort.
- Create efficiency by reducing data processing time.

Business Process Improvement Savings Summary

Current Process	Action	New Process	Time Savings	Cost Savings
Board of Supervisors requests VDOT to make addition.	Certified copy of resolution required for all additions.	**Board of Supervisors** requests VDOT to make addition. Process remains the same.	N/A	N/A
Resident Engineer coordinates processing of any agreements required between County and State through **Local Assistance Division** and prepares addition assembly for submission to the **Local Assistance Division**, consisting of the following:	Actions apply to all Additions.	Coordination process remains the same. Initiation of assembly will be replaced by RNS form.	25%	FTE labor savings of 2.25. $146,000
Certified copy of the BOS's resolution.	Required in all cases.	Process remains the same.	N/A	N/A
Completed Form SR-3	Required for Rural Additions, but not for subdivisions or school roads.	Process will be replaced by RNS form.	50%	FTE labor savings of 0.5. $32,500
Completed Forms SR-4, SR-5 and TE-SYSINV-1	Required in all cases.	Process will be replaced by RNS form.	50%	FTE labor savings of 0.5. $32,500
Surety and Maintenance Fees	As required for subdivisions only.	Process remains the same.	N/A	N/A
Supporting map and sketches of the additions	Required in all cases.	Process will be replaced by GIS	100%	FTE labor savings of 1. $65,000

Current Process	Action	New Process	Time Savings	Cost Savings
		centerlines.		
Payment of all voluntary or required participation	Required for Rural Additions, but not for subdivisions or school roads.	Process remains the same.	N/A	N/A
Secondary Roads Division • Reviews assembly & processes it for action by Commissioner. • Forwards mapping information to Mobility Management Division. • Advises BOS and VDOT staff of Commissioner's action. • Prepares resolution and monthly report for affirmation by CTB.	Actions apply to all Additions	Process will be replaced by RNS form.	75%	FTE labor savings of 2. $130,000
CTB affirms Commissioners actions	Action apply to all Additions	Process remains the same.	N/A	N/A
IT Applications Data is loaded into Highway Traffic Records Information System (HTRIS).	Action apply to all Additions	Process will be replaced by RNS form.	50%	FTE labor savings of 4. $260,000
OPA Cartography Data is digitized into Cartographic GIS.	Action apply to all Additions	Process will be replaced by RNS form.	90%	FTE labor savings of 1. $65,000

Total average annual roadway updates/entries performed: 600
Total FTE labor savings: 11.25
Total Cost Savings: $731,000/Annually

Approximately 30 FTE's are involved in this acceptance process. We are estimating that VDOT could reduce this effort by approximately 38% after we eliminate the duplication of effort. The above improvement applies only to the Roadway Inventory processes associated with the current HTRIS system.

Total Savings
The sum total savings for this category is **$3.655,000.**

Item 5: Revenue from Improved Inventory Report (RDI) - Cost Savings $142,500.

Business Objectives
- Eliminate the lost revenue due to incomplete annual roadway inventory reporting that is used for federal and state funding of roadway maintenance.

Benefits
In prior years, VDOT often under-reported their total roadway network by significant mileage resulting in a significant revenue loss for maintenance activities. This problem was due in large part to inefficiencies in roadway acceptance processing such that accepted roads were not entered into HTRIS until many months after VDOT accepted the road into the State inventory. Since HTRIS is the source for the data in the annual report feeding the State Mileage Tables, reported mileage often lagged behind actual mileage.

A review of the current acceptance process, the roadway "assembly" data entry backlog, and the normal lag in this process reveals that an average of only 19 miles of roadway per year are NOT included in the state inventory at the time of the annual reporting that might be entered in a more timely manner with a new RNS process. Using a VDOT maintenance figure of $1,500 per year, one can estimate a savings of $28,500 per year if these roads had been entered in a timelier manner.

		Annual Calculation of Roadway Inventory Mileage		
Year	Secondary Road Miles from HTRIS	HTRIS Yr. to Yr. Mileage Difference	Actual Miles Accepted	Road Miles NOT Claimed For Funding
1997	46,655			
1998	46,826	171	216	45
1999	47,138	312	195	-117
2000	47,247	109	205	96
2001	47,451	204	194	-10
2002	47,582	131	214	83
Total		927	1,024	97
Average		185	205	19

Data taken from 12/31/2002 VDOT Mileage Tables and DACSS master files

Total Savings
    The sum total savings for this category is **$142,500.**

Item 6: Upgrade Pontis with HTRIS Bridge Info (STI) - Cost Savings $1,950,000

Business Objectives
- Eliminate the manual costs associated with controlling and validating data that must be entered in the STI, FMS, Trns*port and PPMS Systems. Eliminate the necessity to create reports from both Pontis and STI. Eliminate the requirement of entering bridge data in Pontis and STI.

Benefits
   The bridge staff expends considerable effort to monitor and control the entry of UPC Numbers in Trns*port, FMS, and PPMS. The coordination of assuring that all charges to FMS for bridge construction are correct requires extra effort from the bridge staff. The exchange of data between PPMS and STI requires time to research and correct problems. By moving all bridge processing functions to the more sophisticated Pontis System, more control information can be maintained in the Pontis database that would alleviate these problems.

   The bridge inspectors and staff are required to enter inspection information in Pontis and all structure information in the STI System. By placing all of the bridge functionality in Pontis, the requirement to enter data into two systems would be eliminated.
The bridge staff must run reports in the both the Pontis and STI Systems to acquire the required information. By placing all bridge functionality in Pontis, the requirement to extract information from two systems would be eliminated.

   The integration of all bridge functionality in the Pontis System will result in cost savings of $390K/yr for each year of the evaluated period beginning with the date that the system goes operational (1 July 2007).

Total Savings
   Sum total cost savings in this category through 2012 is assumed to be **$1,950,000.**

Item 7: Create an Electronic M-20 File for New Construction & Maintenance Schedule Pavement Projects (PAV) - Cost Savings $200,000

Business Objectives
- Eliminate the manual data entry cost of entering pavement data from a M-20 Document into the Pavement Subsystem.

Benefits
   The district pavement management engineer must enter all pavement data for new pavement construction or maintenance schedule projects from a M-20 paper document in the HTRIS Pavement Subsystem. The M-20 document is created by the inspector who gathers the information from the CAS/CWB Systems and completes the M-20 Form. The M-20 Form is sent to the district pavement management engineer who then enters the data into the HTRIS Pavement Subsystem.
The RNS System will create an electronic M-20 File that will update the pavement information in the pavement subsystem. This process will eliminate the duplicate data entry.
The creation of an electronic M-20 File will result in cost savings of $40K/yr for each year of the evaluated period beginning with the date that the system goes operational (1 July 2007).

Total Savings

Sum total cost savings in this category through 2012 is assumed to be **$200,000.**

Item 8: Efficiency Due to Ad-Hoc Reporting (CEN) - Cost Savings $200,000

Business Objectives

- Eliminate the cost of having a number of skilled programmers write NatQuery and Natural code to extract the information users need from HTRIS as part of normal day-to-day operations.

Benefits

HTRIS has required the intervention of programmers to retrieve basic data in a useable format as is required on a regular basis. ADABAS Natural and NatQuery are not everyday user tools that allow easy retrieval of data from HTRIS. In order to obtain meaningful data, a specific program has to be written to extract the data.

The RNS Oracle backend database combined with the web services to retrieve data efficiently will save the current users many hours of expensive programming time and provide a savings estimated to be a third of a man-year annually. Using the loaded rate of $120K for a man-year, the estimated annual savings is $40K.

Total Savings

The sum total savings for this category is **$200,000.**

Table of Total Tangible Benefits to Costs

Roadway Network System

Benefits-Cost Analysis, Return On Investment, Payback Period, Net Present Value

Benefits	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTAL
1) Mainframe Service Retirement					350,000	350,000	350,000	350,000	350,000	**1,750,000**
2) Retirement of VDOT ETL Software/Training					45,000	40,000	40,000	40,000	40,000	**205,000**
3) Cost Avoidance - HTRIS Extracts (data availability begins 2005)		150,000	50,000	50,000	50,000	50,000				**350,000**
4) RDI Business Process Improvement (see detailed table)					731,000	731,000	731,000	731,000	731,000	**3,655,000**
5) RDI Road Acceptance Efficiency Increases Funding (19 mi/yr @ $1,500/mi)					28,500	28,500	28,500	28,500	28,500	**142,500**

	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTAL
6) Upgrading Pontis to Process HTRIS Bridge Information (FMS/PPMS/Trns*port data accessibility, consolidated reporting, efficient inspection data entry)					390,000	390,000	390,000	390,000	390,000	**1,950,000**
7) PAV Process Improvements					40,000	40,000	40,000	40,000	40,000	**200,000**
8) CEN Efficiency of Ad-hoc Reporting					40,000	40,000	40,000	40,000	40,000	**200,000**
Total		$150,000	$50,000	$50,000	$1,674,500	$1,669,500	$1,619,500	$1,619,500	$1,619,500	**$8,452,500**

Costs	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTAL
Internal Staff Labor	90,000	600,000	600,000	500,000						**1,790,000**
Services	90,000	600,000	600,000	500,000						**1,790,000**
Software		59,000	363,000	102,000	102,000	102,000	102,000	102,000	102,000	**1,034,000**
Hardware		17,000	50,000	56,000	56,000	56,000	56,000	56,000	56,000	**403,000**
IV&V	10,000	100000	50,000	50,000						**210,000**
UAT & Training	10,000	10,000	50,000	100,000	100,000	25,000				**295,000**
Contingency (Risk)	50,000	200,000	200,000	200,000						**650,000**
Total	$250,000	$1,586,000	$1,913,000	$1,508,000	$258,000	$183,000	$158,000	$158,000	$158,000	**$6,172,000**

Annual B-C	($250,000)	($1,436,000)	($1,863,000)	($1,458,000)	$1,416,500	$1,486,500	$1,461,500	$1,461,500	$1,461,500
Net B-C	($250,000)	($1,686,000)	($3,549,000)	($5,007,000)	($3,590,500)	($2,104,000)	($642,500)	$819,000	$2,280,500

Payback Period: 3.4 yrs.   (after project implementation)

Net Benefits = Benefits - Costs $2,280,500

ROI (Net Benefits \Costs X 100):   36.95%

Net Present Value (5%): $1,073,864   (at 4% interest)

Project Intangible Benefits

Intangible benefits that do not have an easily identified dollar value are extremely important to VDOT for the future well being of its enterprise data management schema. Many examples of how data accuracy, timeliness, and availability provide a service to our customers can be given to validate the importance of this project.

The following potential benefits are just a few examples of benefits that have been identified and NOT calculated as having a specific dollar value.

Temporal Synchronization of Critical Project Data

A number of inefficiencies result from VDOT's roadway inventory not being in synchronization with other systems throughout the agency. As an example, in order for the Financial Management System to process business data related to road projects, the roads must be accurately represented in the inventory. Without an up-to-date inventory in HTRIS, charges cannot be assigned to the correct assets since they do not exist in the inventory database. The RNS will greatly improve the temporal synchronization of business data throughout the agency.

Projections for Inventory Maintenance and Accuracy of Estimating

Knowing the exact location, the composition, and condition of VDOT's roads is critical for estimating pavement measurements used for maintenance and operations activities. The RNS will help contribute to the continued improvement process regarding what VDOT has and where it is located.

Customer Service to the Public

The public expects VDOT to respond to deteriorating roadway conditions rapidly. In snow or weather-related emergencies, VDOT must be able to link conditions to locations quickly and monitor changes in the status of these conditions. The RNS will identify accurately and reliably those locations requiring their immediate response.

Emergency Response and Preparedness

As evidenced during hurricane Isabel, the joint effort of utility and VDOT services is often required to address emergencies affecting critical transportation processes. Knowing the best evacuation route to escape an approaching storm, predicting the effect of rising water from a storm surge, determining a safe alternate route that still satisfies height and weight restrictions for transport of large equipment are just a few examples of how geospatial referencing of VDOT's roads will enhance the safety of commonwealth individuals and businesses.

Commonwealth and VDOT Strategic Vision and Direction

- The planned solution meets many of the conceptual and technical requirements of the Commonwealth Enterprise Architecture Standards.
- The planned solution delivers the latest relevant information through a solution that is extensible and open thus sharing information easily to all interested parties.
- Moves the retention of roadway network information, as currently held in HTRIS, in the direction of being compliant with the VITA Spatial Data Library.